FHC-1D user manual

The Fan and Heater Control (FHC-1D) automatically controls the temperature in a room by adjusting the speed of variable speed fans and controlling a heater interlock.

When the temperature is at the set point, the FHC-1D operates the fans at the idle speed setting and the heater is off. When the temperature exceeds the set point, the FHC-1D increases the speed of the fans. When the temperature drops below the set point, the FHC-1D shuts off the fans (in shut-off mode) or operates the fans at idle speed (idle mode) and switches on the heater or heat lamps.

Features

- One variable speed output
- One heater interlock output
- Automatic shut-off and idle modes
- Adjustable off set-back for shut-off mode
- Adjustable idle speed for idle mode
- Adjustable temperature set point
- Adjustable temperature differential
- Three-second full-power-turn-on to minimize fan ice-up
- Two-digit LED display
- Fahrenheit and Celsius display
- Error code display for troubleshooting
- Overload protection fuse
- Six-foot temperature probe, extendable to 500 feet
- Rugged enclosure (corrosion resistant, water resistant, and fire retardant)
- CSA approval
- Two-year limited warranty

Electrical ratings

- Input: 120/230 VAC, 60 Hz
- Variable stage: 10 A at 120/230 VAC, general-purpose (resistive)
  7 FLA at 120/230 VAC, PSC motor
  1/2 HP at 120 VAC, 1 HP at 230 VAC, PSC motor
- Variable stage fuse: 15 A, 250 VAC ABC-type ceramic
- Relay: 10 A at 120/230 VAC, general-purpose (resistive)
  1/3 HP at 120 VAC, 1/2 HP at 230 VAC
  360 W tungsten at 120 VAC

The FLA (full load ampere) rating accounts for the increase in motor current draw when the motor operates at less than full speed. Make sure the motor/equipment connected to the variable stage does not draw more than 7 FLA.

Fill out the information below to help configure your control and verify that you do not exceed the electrical ratings of the FHC-1D.

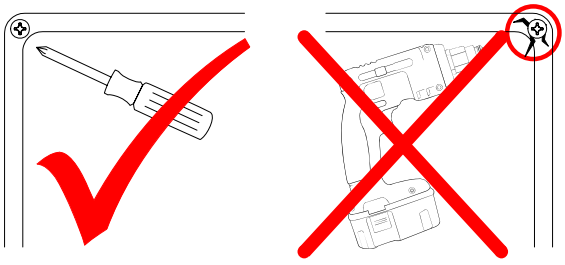
Fans	**A** **Maximum current draw per fan**	**B** **Number of fans**	**A × B** **Total current draw**
Make			
Model			
Voltage rating			
Power factor			
Heater or furnace	**Maximum current draw**	**Voltage rating**	
Make			
Model			

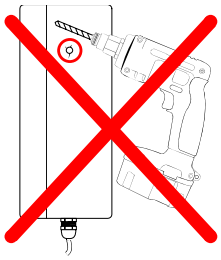
Installing the FHC-1D

The FHC-1D must be installed by a qualified electrician.
Before installing or servicing the FHC-1D, switch OFF the power at the source.
Install the FHC-1D according to local electrical codes.

Mount the enclosures on a sheltered, vertical surface, with the electrical knockouts facing down.

Use a screwdriver to tighten the screws in the enclosures. Do not use a drill or over tighten the screws; this can crack the enclosures and ruin the watertight seal.





Use the electrical knockouts for bringing wires or cables into or out of the enclosures. Use watertight strain reliefs or conduit connectors at all cable-entry points.

Do not make additional holes in the enclosures; this can damage the watertight seal or control components and void the warranty.

When connecting electric heaters or brooder lamps and a furnace to the FHC-1D, remember that operation voltages might be different. This could damage the equipment.

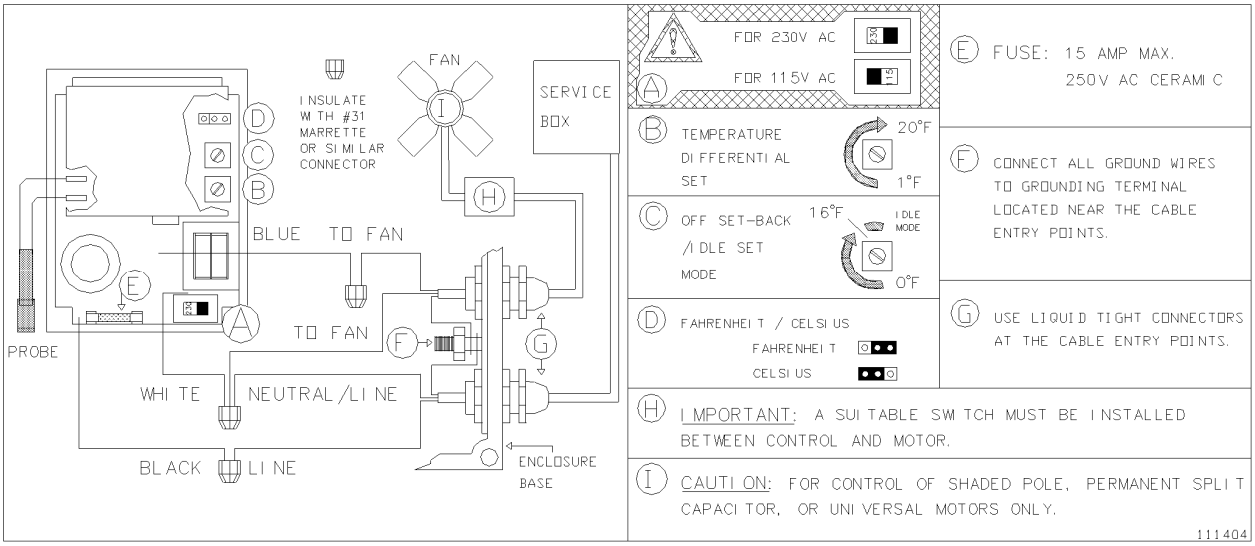
Only permanent split capacitor motors appropriate for variable speed control, or shaded pole motors, can be used on the variable stages.

Mounting the FHC-1D

1. Remove the cover from the enclosure.
2. Fasten the FHC-1D to the mounting surface using the fours screws provided.

Wiring the FHC-1D

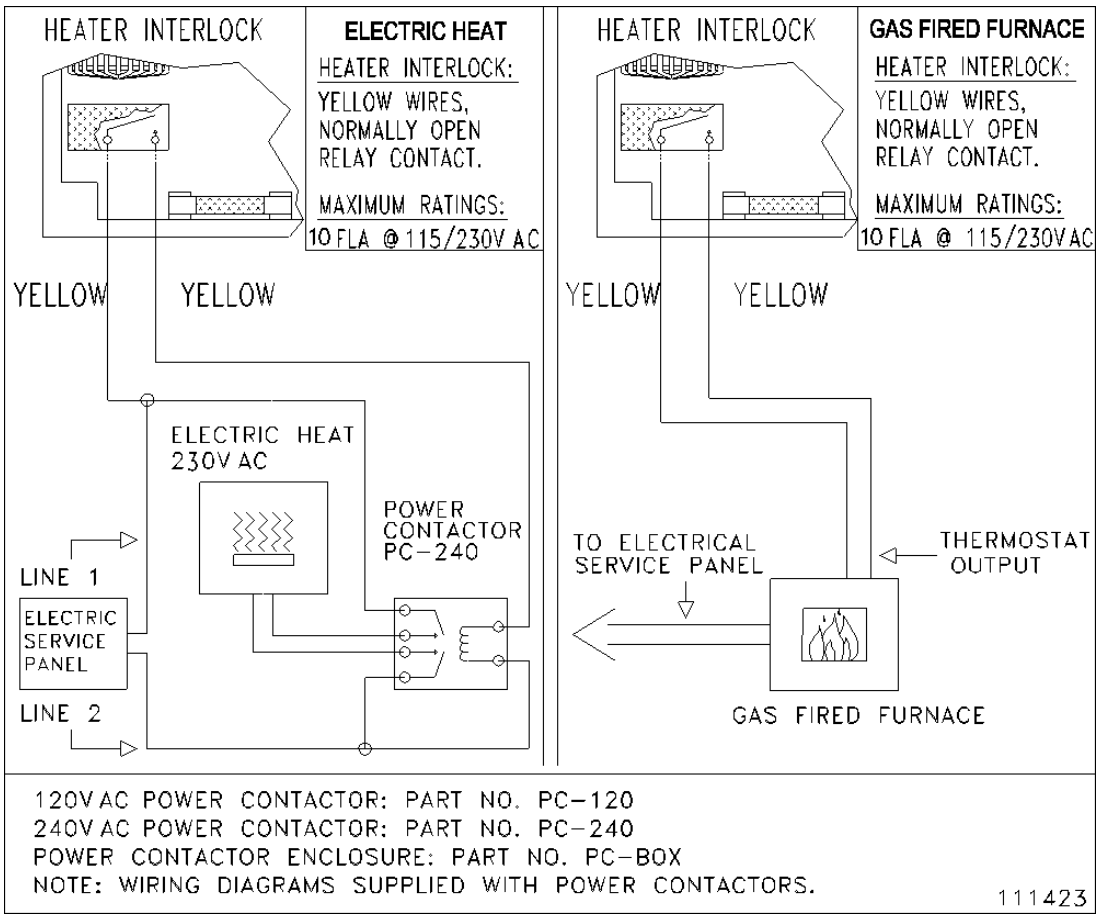
1. Set the voltage switch **A** to the correct position for the line voltage used (120 or 230 VAC).
2. Set jumper **D** to the correct position for the temperature units, Fahrenheit or Celsius, you want to use.
3. Connect the wires as shown below.



Connecting equipment to the heater interlock

The heater interlock output is a normally-open relay contact that switches a heater or furnace ON or OFF. The relay contacts close when the temperature is 2°F below the TEMP SET.

Connect the wires as shown in the following diagram. Use power contactors (not supplied) for electric heat or heat lamps. Connect directly for most gas furnaces.



Connecting the temperature probe

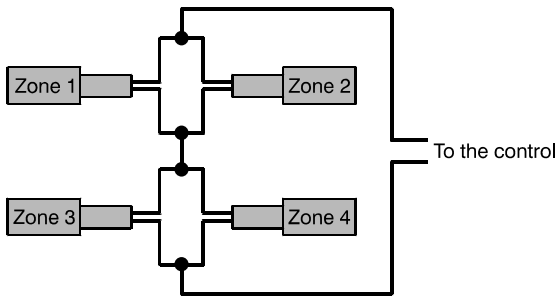
Follow the guidelines below and connect the temperature probe as shown in the diagram on page 4.

- Do not run the probe cable in the same conduit as AC power cables
- Do not run the sensor cable beside AC power cables or near electrical equipment.
- When crossing other cables or power lines, cross them at a 90 degree angle.

Using four-zone averaging

The FHC-1D can monitor the temperature in four different zones. The control takes an average of the four temperatures and operates according to the average temperature.

To use four-zone averaging, you must connect four temperature probes to the unit, as shown to the right.

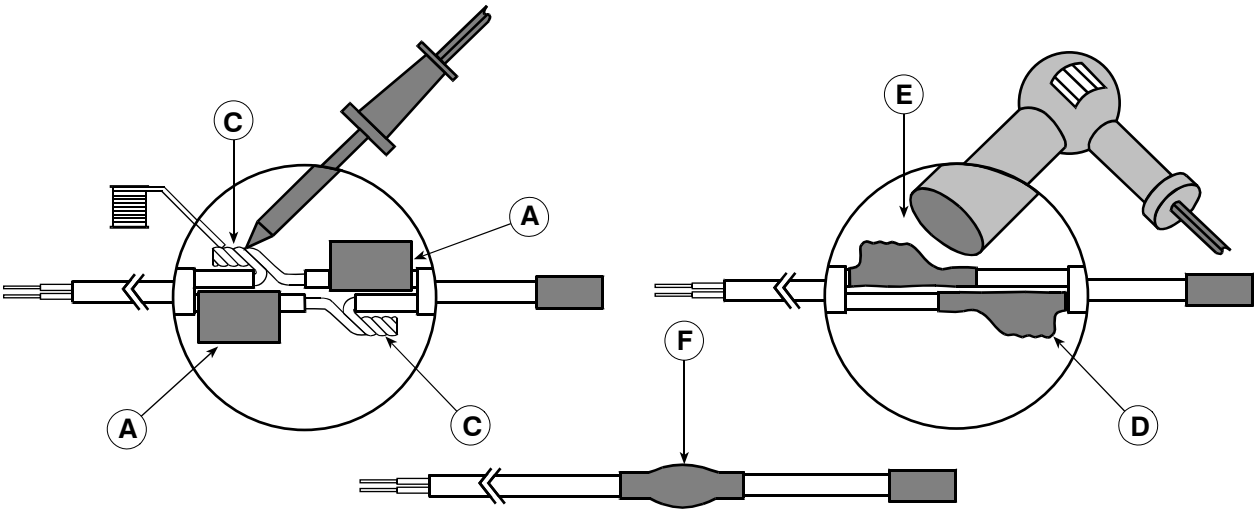


Extending temperature probe cables

You can extend temperature probe cables to lengths of up to 500 feet. Follow the guidelines below and on page 5 when extending cables.

- Use two-wire 18 AWG jacketed cable. Phason recommends Belden # 9408, Alpha # 5052, or an equivalent. Extension cable is also available from Phason. For more information, contact your dealer or Phason.
- Join the extension cable to the temperature probe cable as shown on the next page.
- If the unit operates erratically with the extended probe, run the cable along a different path or shorten it.

To extend probe cables



A Slide three pieces of heat shrink tubing over the wires: one for the red wire, one for the black wire, and one for both.

B Strip the ends of the wires and then twist them together.

C Solder the wires together using rosin-core flux solder—DO NOT use acid core solder.

D Slide the heat shrink tubing over the solder joints.

E Shrink the tubing using a heat gun.

F Your connection should look like this.

Getting started

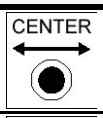
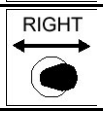
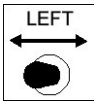
When power is applied to the FHC-1D, the following will be displayed:

1. **88** will be displayed for approximately 0.25 seconds (start-up).
2. **00** will be displayed for approximately one second (self-test).
3. **60** will be displayed for approximately one second. **60** indicates that the power system is 60Hz.
4. The display will alternately flash between the temperature and **PF**. This indicates a power interruption or start-up has occurred.
5. To clear the **PF**, click the switch to the right.
   The control is now in 'normal' mode.

Display alerts

Alert	Description
PS	The temperature probe or sensor cable has short circuited.
Pd	The temperature probe is damaged or the connecting wire is broken.
tS	The Temperature knob has accidentally been turned. The display will alternately flash tS and the ambient temperature. The control will not accept the new setting until the switch is clicked to the set position. *or* The voltage switch is set to 230 volts, but the incoming power is 120 volts. Check the voltage switch.
PF	The power has been interrupted. The display will flash between PF and the temperature. To clear the alarm, click the switch to the right. The control will function normally.

Displaying and adjusting parameters

Switch position	Function
	◇ Displays the ambient temperature
	◇ Allows you to view and adjust the temperature set point ◇ Clears alarms
	◇ Allows you to view and adjust the differential (d I), off set-back (o5), and idle speed (Id). Each time the switch is clicked and held in this position, the next parameter is displayed. The display flashes between the parameter code (two letters) and it's setting (two digits). You can adjust the parameter at this point. The cycle starts over after the last parameter. To restart at the beginning of the cycle, click the switch to the right.

Parameter	Code	Range	Factory setting	Location
Temperature set point	N/A	32 to 99°F (0 to 38°C)	N/A	External knob
Idle speed	Id	0 - 99%	N/A	External knob
Temperature differential	d I	1 to 20°F (0.6 to 12°C)	6°F	Internal trimmer
Off set-back	o5	0 to 16°F (0 to 9°C)	5°F	Internal trimmer
°F or °C (ambient temp.)	°F / °c	-22 to 99°F (-30 to 38°C)	°F	Internal jumper

Changing the temperature display units

The °F/°C jumper lets you select whether the FHC-1D displays temperatures in degrees Fahrenheit or Celsius. To change the setting, position the jumper as shown in section D on page 4.

About the hysteresis

The FHC-1D has a 1°F (0.5°C) hysteresis. This means the fan will turn off 1°F below the point it turned on.

For example, if TEMP SET is 75°F, the fan will turn on at 75°F, off at 74°F. This prevents the fan from flickering on and off at the TEMP SET.

Off set-back/IDLE SET Mode (OSB)

OSB is the number of degrees Celsius or Fahrenheit below the TEMP SET that the fan will switch between OFF and IDLE. IDLE mode provides minimum ventilation at temperatures below the TEMP SET. For more information, see **Example 1, operation in off set-back (OSB) mode** on page 13.

To display and adjust OSB

1. Click the switch to the right to start at the beginning of the parameter list.
2. Click the switch to the left two times and then hold. The display flashes between **oS** and the setting. If **Id** is displayed, the control is in IDLE SET mode.
3. Use a small flat screwdriver to adjust the internal trimmer to the desired OSB or turn the trimmer fully clockwise to put the control into IDLE SET mode. See section C of the diagram on page 4 for trimmer location.

Adjusting minimum ventilation in OSB mode

There must be a temperature probe connected before adjusting the minimum ventilation.

1. Turn the **Idle Speed** knob fully counter-clockwise and then back ¼-turn clockwise.
2. Click the front cover switch to the right and hold while turning the **Temperature** knob fully clockwise and then release the switch. The fan should not be running
3. Click the front cover switch to the right and hold while slowly turning the **Temperature** knob counter-clockwise. When the fan runs full speed, release the front cover switch and the **Temperature** knob.
   The fan runs at maximum speed for approximately three seconds, and then at IDLE. The **Temperature** knob should be approximately one °F higher than the temperature.
4. Slowly adjust the **Idle Speed** knob until a satisfactory IDLE has been reached. A voltmeter is helpful for determining the voltage. If you are unsure, see your fan dealer for the minimum idle voltage for your fan motor.
5. Click the front cover switch to the right and adjust the **Temperature** knob to the desired temperature.
6. Release the switch.

Adjusting minimum ventilation in IDLE SET mode

1. Turn the **Idle Speed** knob fully counter-clockwise.
2. Click the front cover switch to the right and hold while turning the **Temperature** knob fully clockwise and then release the switch. The fan should be running at IDLE.
3. Slowly adjust the **Idle Speed** knob until a satisfactory IDLE has been reached. A voltmeter is helpful for determining the voltage. If you are unsure, see your fan dealer for the minimum idle voltage for your fan motor.
4. Hold the front cover switch to the right and then adjust the **Temperature** knob to the desired temperature.
5. Release the switch.

Adjusting the idle speed (IDLE)

The IDLE is the speed of the fan in IDLE SET mode. In other words, minimum ventilation. IDLE is displayed as a percentage of maximum speed. For more information, see **Operation description** on page 13.

To display and adjust IDLE

1. Click the switch to the right to start at the beginning of the parameter list.
2. Click the switch to the left four times and hold.
   The display alternately flashes between **Id** and the setting.
3. Adjust the **Idle Speed** knob on the front cover to the desired fan speed.
4. Release the switch

Adjusting the temperature set point (TEMP SET)

TEMP SET is the desired temperature. It is also the reference for the off set-back (OSB) and temperature differential (DIFF) settings.

To display and adjust TEMP SET

1. Hold the switch in the set (right) position.
2. Adjust the **Temperature** knob to the desired setting.

You must hold the switch in the set position while turning the **Temperature** knob. If this is not done correctly, the display will flash between **tS** and the temperature display, indicating the knob has accidentally been turned. The control will not accept the new setting until the switch is clicked to the right.

Adjusting the temperature differential (DIFF):

DIFF is the number of degrees Celsius or Fahrenheit above the TEMP SET that the fan reaches maximum speed. For example, if the TEMP SET is 80°F and the DIFF is 6°F, the fan will increase from IDLE at 80°F to maximum speed at 86°F. See Figures 4 and 5 for examples.

To display and adjust DIFF

1. Click the switch to the right to start at the beginning of the parameter list.
2. Click the switch to the left once and then hold.
   The display flashes between **d I** and the setting.
3. Use a small flat screwdriver to adjust the internal trimmer. See section B of the diagram on page 4 for trimmer location.

> The difference in motor power factors can cause the actual differential to be less than the displayed value. If the power factor of the motor is available, use the correction numbers and formula below to calculate the correct DIFF setting.

Power factor	1.0	0.9	0.8	0.7	0.6	0.5
Correction (°F)	1.00	1.05	1.10	1.25	1.33	1.60

actual differential = desired differential × correction

Example 1

◇ To have an actual differential of 6°F with a motor that has a power factor of 0.7, set the differential to 7.5°F.

◇ 6°F × 1.25 = 7.5°F

Example 2

◇ To have an actual differential of 5°F with a motor that has a power factor of 0.5, set the differential to 8.0°F.

◇ 5°F × 1.6 = 8.0°F

If you do not know the power factor, calculate the correction as follows:

1. Set the idle speed properly. For more information, see **Adjusting minimum ventilation in IDLE SET mode** on page 10.
2. Set the differential to 10°F with the internal trimmer. Note the temperature (**T1**) in the digital display.
3. Press and hold the switch to the right and adjust the temperature set point to equal the temperature from step 2. The fan operates just above the idle speed.
4. Slowly decrease the temperature set point and listen to the fan increase in speed. When the motor reaches full speed, note the temperature set point (**T2**).

5. Calculate the correction using the following formula.
   Correction = 10°F ÷ (**T2** – **T1**)

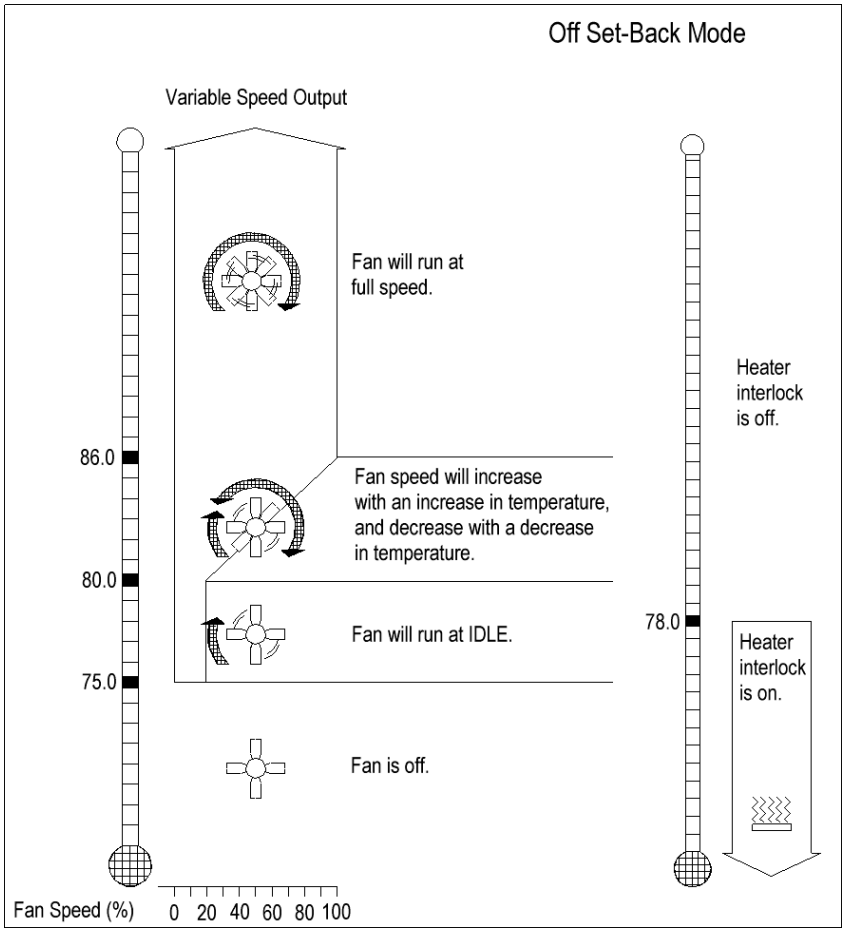
Example 3

◇ For a T1 temperature of 75°F and a T2 temperature of 82°F, the correction is 1.43.
◇ 10°F ÷ (82°F-75°F) = 1.43
◇ If the desired differential is 5°F, the actual differential can be calculated as follows: 5°F × 1.43 = 7.15°F.
◇ Set the differential to 7°F for an actual differential of 5°F.

Operation description

Example 1, operation in off set-back (OSB) mode

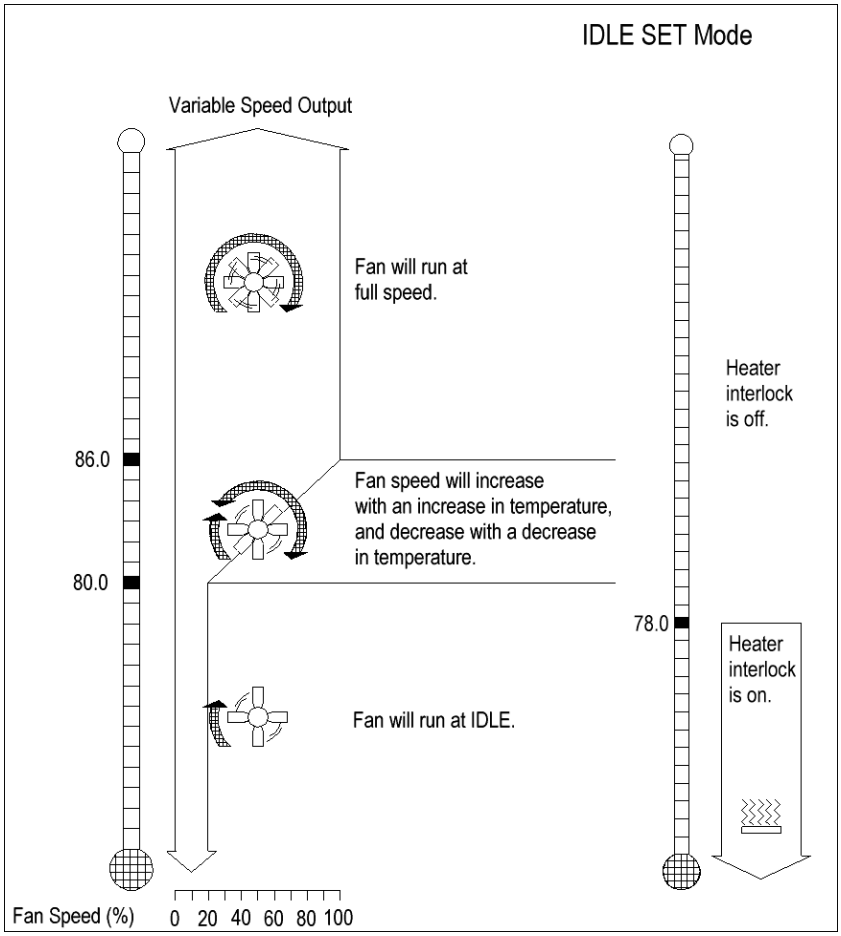
TEMP SET	DIFF	OSB	IDLE
80°F	6°F	5°F	20%



1. The fan will be off and the heater interlock will be on when the temperature is below 75°F.
2. When the temperature increases to 75°F (OSB) the fan operates at full speed for three seconds, then IDLE (minimum ventilation of 20%). The fan will continue to IDLE between 75°F and 80°F.
3. At 78°F the heater interlock shuts off.
4. Between 80°F and 86°F (DIFF) the fan speed changes proportionally with the temperature. If the temperature increases, fan speed increases. If the temperature decreases, fan speed decreases.
5. The fan operates at maximum speed when the temperature is at or above 86°F (maximum ventilation).
6. When the temperature drops, the reverse happens.

Example 2, control operation in IDLE SET mode

TEMP SET	DIFF	OSB	IDLE
80°F	6°F	off	20%



1. Below 78°F the heater interlock will be on.
2. The fan operates at IDLE (20% of maximum ventilation) when the temperature is below 80°F.
3. Between 80°F and 86°F (DIFF) the fan speed changes proportionally with the temperature. If the temperature increases, fan speed increases. If the temperature decreases, fan speed decreases.
4. The fan operates at maximum speed when the temperature is at or above 86°F (maximum ventilation).
5. When the temperature drops, the reverse happens.

Maintaining the FHC-1D

Proper care and maintenance will help your FHC-1D last longer. To prevent damage to the control, perform the following steps after the first two weeks of operation, and once a year after that.

1. Switch off the power to the control.
2. Remove the cover and check inside for moisture. If there is any moisture, wipe it away using a dry cloth.
3. Check all cable entry points to make sure they are properly sealed. If they are not properly sealed, apply silicone sealant around the entry points.

If you need to seal the enclosure, use a sealant that is labelled as 'non-corrosive', 'electronics grade', or 'neutral cure', such as GE Silicone RTV6780B, RTV 142, or RTV 162.

Do not use a sealant that is labelled as 'acetic acid cure' or 'acetoxy cure'. These sealants release acetic acid while curing, which can damage the control and will void the warranty.

4. Check all wires to make sure they are properly connected and that they are in good condition.
5. Fasten the cover to the enclosure and then switch on the power to the control.

Cleaning the FHC-1D

To clean the FHC-1D, wipe the surface with a damp cloth.

Be careful when washing the room using a high-pressure washer. DO NOT spray the control using a high-pressure washer, this can damage the control and will void the warranty.

Evidence of moisture damage inside the control will void the warranty.

Limited warranty

This warranty applies only to the Phason Inc. (Phason) Fan and Heater Control (FHC-1D). If you need warranty service, return the product and original proof of purchase to your dealer.

Phason warrants the FHC-1D subject to the following terms and conditions.

This warranty is valid only to the original purchaser of the product, for two years from the manufacturing date. The manufacturing date is stated in the first eight digits of the serial number in the form year-month-day.

Phason hereby warrants that should this product fail because of improper workmanship, Phason will repair the unit, effecting all necessary parts replacements without charge for either parts or labor.

Conditions

- Installation must be done according to Phason's enclosed installation instructions.
- The product must not have been previously altered, modified, or repaired by anyone other than Phason.
- The product must not have been involved in an accident, misused, abused, or operated or installed contrary to the instructions in our user and/or installation manuals. Phason's opinion about these items is final.
- The person requesting warranty service must be the original purchaser of the unit, and provide proof of purchase upon request.
- All transportation charges for products submitted for warranty must be paid by the purchaser.

Except to the extent prohibited by applicable law, no other warranties, whether expressed or implied, including warranties of merchantability and fitness for a particular purpose, shall apply to this product. Any implied warranties are excluded.

Phason is not liable for consequential damages caused by this product.

Phason does not assume or authorize any representatives, or other people, to assume any obligations or liabilities, other than those specifically stated in this warranty.

Phason reserves the right to improve or alter the FHC-1D without notice.

Phason controls are designed and manufactured to provide reliable performance, but they are not guaranteed to be 100 percent free of defects. Even reliable products can experience occasional failures and the user should recognize this possibility.

If Phason products are used in a life-support ventilation system where failure could result in loss or injury, the user should provide adequate back up ventilation, supplementary natural ventilation, or an independent failure-alarm system. The user's lack of such precautions acknowledges their willingness to accept the risk of such loss or injury.

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